association of accumulating secretory products and the Golgi apparatus. He reported that granules for secretion first appeared in the meshes of the Golgi apparatus and proposed that after reaching a particular size, parts of the apparatus broke free and collected near the boundary of the cell. In a review paper in 1929, Robert Bowen defended the claim that the Golgi apparatus figured centrally in cell secretion, building up in the organelle and separating from it in different ways in different tissues.

In the first half of the twentieth century there was a long history of claims to the effect that the Golgi apparatus was an artifact of silver or osmium staining. Thomas Strangeways and R. G. Canti (1927) made such a case on the grounds that they were unable to find any evidence of the Golgi apparatus in unstained tissue-cultured cells either by direct or dark ground illumination. Many of these claims were followed by counterclaims. Richardson (1934), for example, claimed to find such evidence in cultured cells and contended that Strangeways and Canti were viewing cells in which the Golgi apparatus was fragmented. He as well as other investigators of the time also differentiated two parts to the Golgi apparatus – an outer part that absorbs osmium and silver and an inner portion that does not.

The strongest case for the claim that the Golgi apparatus was an artifact came from demonstrations that the preparation of cells for microscopy could result in a structure with the appearance of the Golgi apparatus. Maurice Parat (1928) proposed that the artifactual structure arose when fixatives caused certain cytoplasmic vacuoles to coalesce. John Baker (1944) further elaborated this view, holding that it actually was produced by deposition of metals (osmium or silver) on the periphery of the vacuoles. Walker and Allen (1927) used chemical models of gelatin, albumen, and lecithin to obtain evidence that the appearance of the Golgi apparatus resulted from the spreading of phospholipid materials on various interfaces produced during fixation. Gicklhorn (1932) claimed that laminated, doubly refractive myelin figures resembling the Golgi apparatus could be produced by treatment of isolated tonoplasts with methods developed by de Vries and suggested that the Golgi apparatus itself was produced by a similar release of myelin and the subsequent staining with silver or osmium.

On the other hand, the strongest evidence for the reality involved showing ways in which one could manipulate it experimentally. Beams and King (1934), applying Beams' centrifuge (see Chapter 4) to the uterine gland cells of guinea pig, caused the Golgi apparatus to appear to stream through the cytoplasm. They took this as indicating a fluid or semifluid character. Bourne (1942, p. 117) accepted this as compelling evidence "that the Golgi apparatus was a definite cell organ."